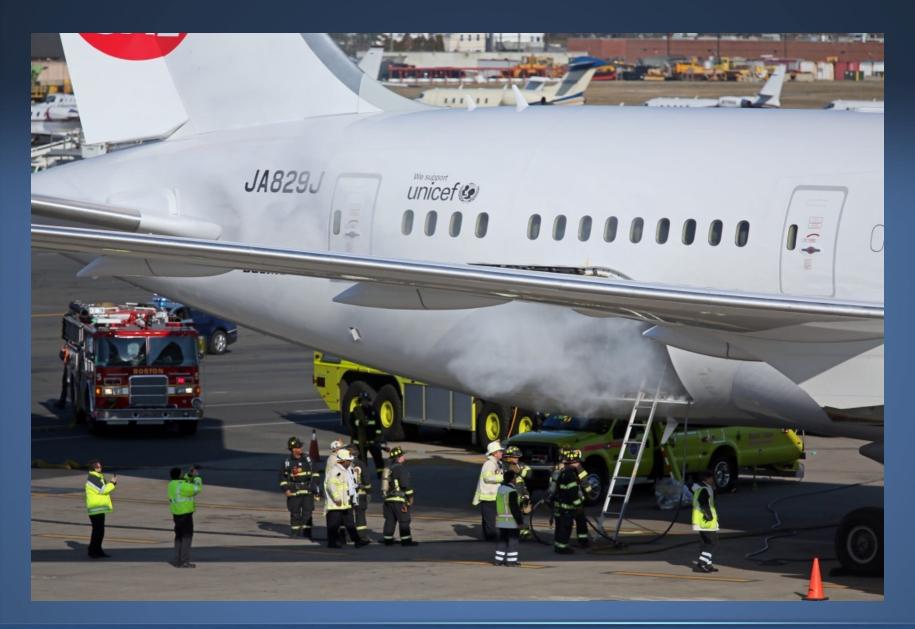


Investigative Update of Battery Fire Japan Airlines B-787 - Jan 7, 2013

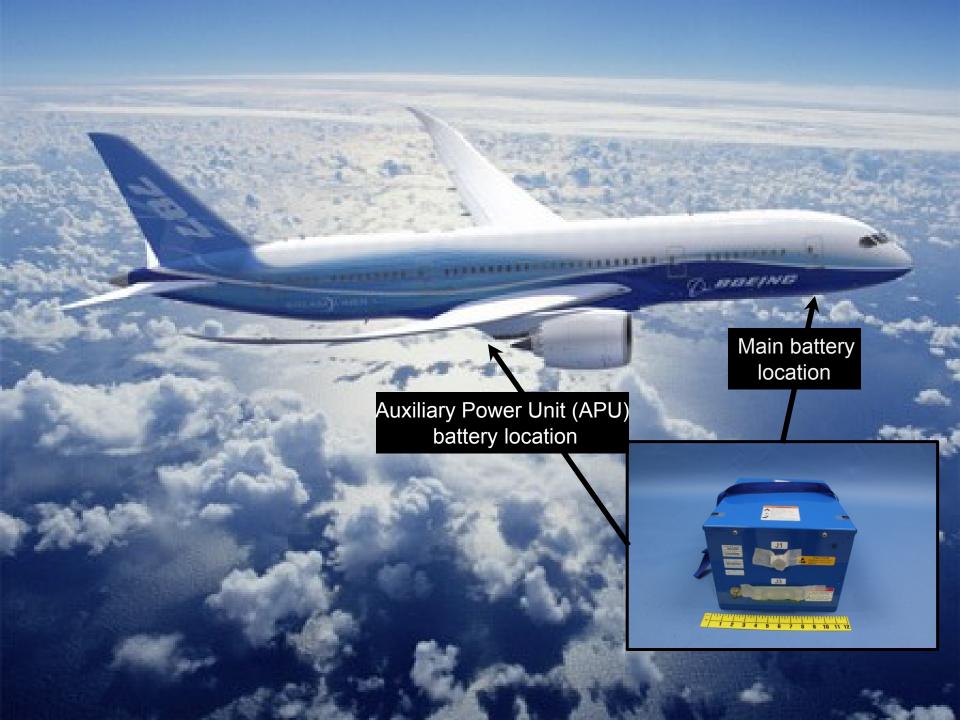
Deborah A.P. Hersman

Chairman

February 7, 2013







Previous Findings

- Fire
- Thermal runaway
- Short circuiting



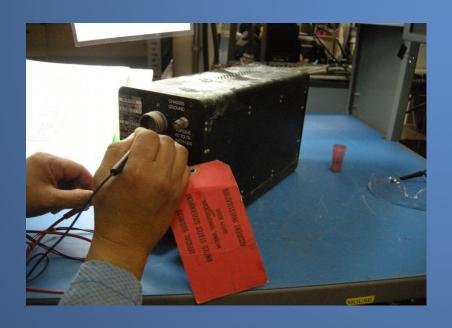
Progress

- Determine the origin of the battery fire
- Determine the cause of the fire
- Review certification documentation and testing



Investigative Work

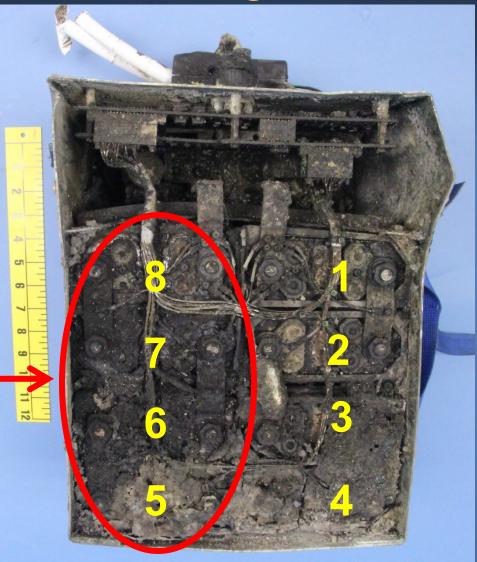
Testing and Examinations







Thermal Damage





Area of

thermal

damage

most

Inside the Battery

Cells on the left side





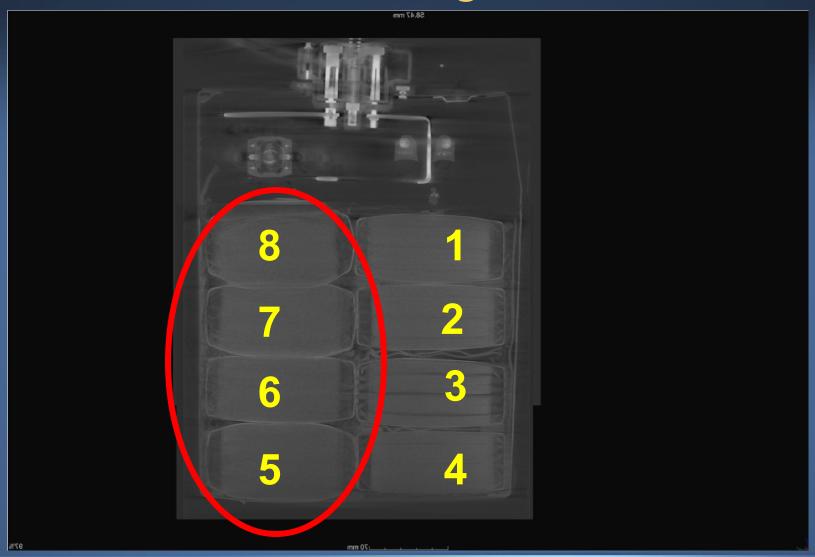


Substantial thermal damage

Moderate thermal damage



Mechanical Damage





Focus on Cell #6



Event battery from JAL airplane



Cell #6

Damaged electrode in Cell #6



Hot Spot

Yellow card is a laboratory marking used for identification purposes.



Ruled Out

Mechanical impact damage



Damage from firefighting efforts



Ruled Out

External short circuit of cell or battery



Viewed From Outside (Post-clean)





Still Being Evaluated

- Cell charging
- Potential manufacturing issues
- Battery design considerations



Certification of the 787 Battery





Certification of the 787 Battery

Federal Register/Vol. 72, No. 196/Thursday, October 11, 2007/Rules and Regulations Amendments 25–1 through 25–117; except §§ 25.809(a) and 25.812, which will remain at Amendment 25–115. If the Administrator finds that the applicable airworthiness regulations do not combain adequate or autoropriate DEPARTMENT OF TRANSPORTATION white reasons are the mean to the temperature of the mean to the m Federal Aviation Administration [Docket No. NM375 Special Conditions No. 25-359-SC] Special Conditions: Boeing Model 787– 8 Airplane: Lithium Ion Battery Installation AGENCY: Federal Aviation AGENCY: rederal Aviation Administration (FAA), DOT. Administration (FRAN):

SUMMAY: Fines special conditions are supported to the Booling Month (France) and the Booling Month (France) are supported to the Booling Month (France) are supported to the surface of the surf ACTION: Final special conditions. a finational to section 07.

29.73, the "Vision Control Act or 19.74".

29.74, the "Vision Control Act or 19.74".

29.75, the "Vision Control Act or 19.74".

29.75, the "Vision Control Act or 19.75".

29.75, the "Vision Control Act or 19.75 model under § 21.101. Novel or Unusual Design Features DATES: Effective Date: November 13, FOR FURTHER INFORMATION CONTACT:
Narth Khanully, FAA, Airplanes and
Flight Grow Information, Alarman and
Certification, Programmer Contact
Transport Airplane Directories, Aircraft
Certification, Service, Neutrino,
Airplane State State State State State State
Manager State Sta FOR FURTHER INFORMATION CONTACT: SUPPLEMENTARY INFORMATION: On March 28, 2003, Boeing applied

On March 28, 2903, Boning applied for an PAA type conflicted for its enew form Model 79: 19 passes graphen. The Boning Model 79: 19 passes graphane with the Boning Model 79: 19 passes graphane with the plane with the work of the plane with the plane with the plane with a maximum takent weight with a maximum 476.000 pound of 381 passengers.

Type Certification Basis

Under provisions of 14 Code of
Under provisions of 14 Code of
Federal Regulations (CFR) 21,17,7
and the control of the code of the code

conditions to require that (1) all, charger sizes of the lithium ion, but of an all instances and instances and instances and the property of the property of

The current regulations governing installation of batteries in large installation of batteries in large transport coggory airplant were tearsport. Civil Air Femalations Civil A

failures. This led to additional rulemaking affecting large transport category and makes as well as great particularly and adjustment of the properties of t

governing naces reserving and proposed use of the interest of Novel or Ususual Design Features
They 37 will incorporate a number of remaining the company of t

batteries. These problems and overcharging, over-discharging, a flammability of cell components.

Overcharging

1. Overchargie,
1. Overchargie

of lithium ion nations of lithium ion nations of power Unit Main and Auxiliary Power Unit (APU) Battery Charger System.

Flight Control Electronics.

Emergency Lighting System.

Recorder Independent Power

System.

Emergency Independents
 Recorder Independents
 Supply
 Recorder Independents
 Independents

2007/Rules and Regulations crew instead of promoting it as an option in managing the threat posed by the use of lithium-ion batteries. ALPA maintains that

the petitioner must provide means for extinguishing fires that occur vs. listing it as an option in § 25.863. ALPA clarified this comment in the following communication, sent by email on August 10, 2007

The intent of our comments submitted to The intent of our comments submitted to the Docket for question [Special Condition] Number 4 (see below) is to assure that the FAA includes language or makes it clear in ee Special Conditions directing the OEM or potential STC applicant that a fire from see devices, in any situation, is acceptable. ALPA requests the FAA erate that preventing a fire and not tripe to one, if one occurs, is critical. The

ting to one, if one occurs, is critical. The ting to one, if one occurs, is critical. The sentence of our comments in this stion (Special Condition) refers to the tial for an "equivalent level of safety" introduced or referenced in the nent that would negate the prevention by ALPA finds this "option"

ptable. stallations of lithium ion batteries through (d)

osal states that the certification ents of § 25.283 [§ 25.863] must be with; however, the FAA report ort DOT/FAA/AR-06/38, September ates that a relatively small fire afficient to heat the lithium-ion ne temperature required to essure release mechanism in causes the cell to forcefully olyte through the relief ports we terminal. The electrolyte is ble and easily ignites when ells released small white h the electrolyte

> se: The FAA shares the it. The regulations and ents defined in these s are intended to attery fires on board ve made no change as

ent re Special commenter suggested ditions address the lithium ion eat or overcharge or malfunction of ect function, onnecting the rging source is not

> AA agrees with Condition (7) t overheating m ion batteries malfunction of function. The e lithium ion We made no

ber 11, 2007/Rules and Regulations

is required for safe operation of the around for all operation of the airplane will peak operation of the airplane will control to a long of the me airplane will control to a long of the me airplane will control to a long of the airplane will control to a long of the airplane will control to a long of the airplane will control to the me airplane will control to the me airplane will control to the cont of those self.

charge.

Note: Tasse special conditions are not not included to replace 14 GPL 25.1353(c) in the carification basis of the RE 25.1353(c) in the airphane. This special condition 270-22 only in thinking in special conditions. The reference and thesis: apply only included the special conditions. The reference and the results of 14 GPR and the results of 15 GPR and the results of 15 GPR and airphane that do not use lithium ion batteries.

Issued in Renton, Washington, on September 28, 2007. Ali Bahrami,

An own and Manager, Transport Airplane Directorate, Aircroft Cartification Service. [FR Doc. E7-19980 Filed 10-10-07; 8:45 am]

DEPARTMENT OF TRANSPORTATION deral Aviation Administration 4 CFR Part 25

ocket No. NM366 Special Conditions No. ecial Conditions: Boeing Model 787-irplane; Composite Wing and Fuel k Structure—Fire Protection

ICY: Federal Aviation inistration (FAA), DOT. N: Final special conditions. ARY: These special conditions are
I for the Boeing Model 787-8
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Special Conditions: ing Model 787-8 blane; ium Ion Battery allation October 11, 2007



Certification of the 787 Battery



Exemplar Battery



JAL Event Battery



Next Steps

- Examine validation methods for certification of battery
- Conduct tests on field replacement batteries
- Open our public docket and provide an interim factual report within 30 days





National Transportation Safety Board